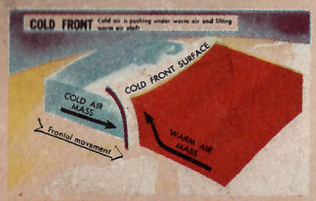
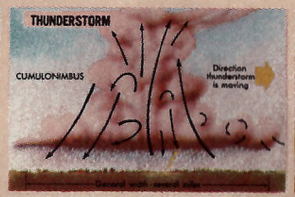
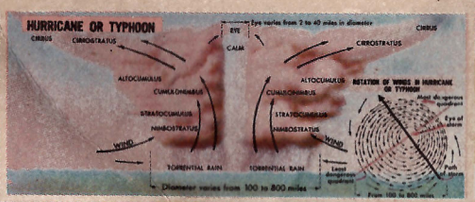
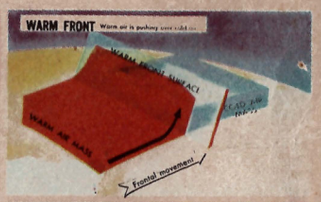
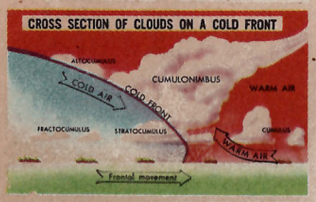
HAMMOND'S WEATHER KIT

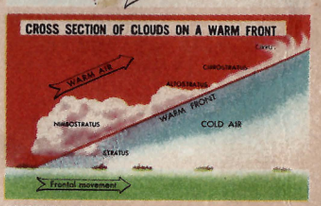


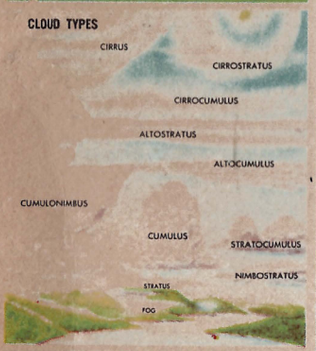


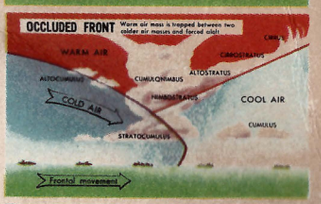


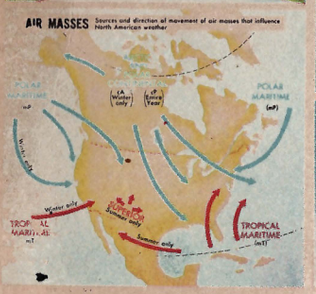


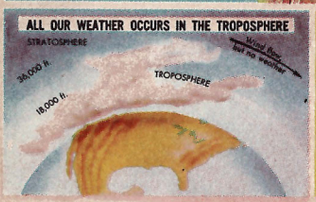


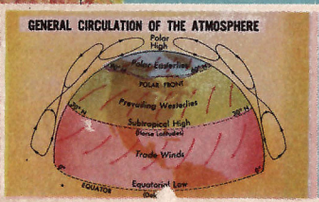


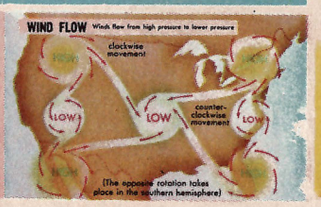


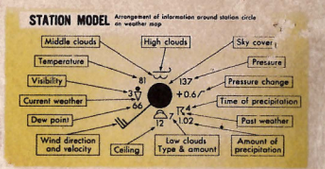












UNDERSTANDING OUR WEATHER

IF PRESENT WIND DIRECTION APPEARS IN ANY HOLE ON THIS SIDE, MOVE IT TO OPENING "A"

IF PRESENT WIND DIRECTION APPEARS IN ANY HOLE ON THIS SIDE, MOVE IT TO OPENING "B"

A B

HAMMOND'S WEATHER WHEEL

W N S E

COLORFUL

29 in. x 42 in.

WEATHER

CHART

AMAZINGLY

ACCURATE

WEATHER

FORECASTER

COMPLETE DIRECTIONS ON BACK OF COVER

UNDERSTANDING OUR WEATHER

ALL OUR WEATHER OCCURS IN THE TROPOSPHERE

Of all the forces of nature, weather influences man's environment most. It affects most all phases of his life, and its forces may have far-reaching consequences. Weather may be defined as the "state of the atmosphere." The atmosphere is a sea of air several hundred miles thick that surrounds the earth. It is divided into different zones, or layers. The layer next to the earth's surface is called the "troposphere," and it is in this layer that all our weather occurs. The air becomes so rarefied, or thin, above this layer that it cannot support the weight of clouds. Air, having weight, exerts a force, or pressure, upon the earth. About three-fourths of the total weight of the atmosphere and all the moisture content are packed into the troposphere.

GENERAL CIRCULATION OF THE ATMOSPHERE

The sun is the single noteworthy source of heat for the earth's atmosphere. It is the force that drives the winds, the ocean currents, and generates the weather. The sun heats the earth's surface unevenly. It is because of this uneven heating that an air circulation is set up by the atmosphere to attempt to equalize heat distribution. Warm air expands and rises, producing an area of low pressure. Cold air contracts and sinks, producing an area of high pressure. The equatorial regions receive more heat than other areas. The polar areas receive the least. This difference in the earth's heating produces a difference in pressures (highs and lows), and as a result, a general pattern of air motion is set up over all the earth.

WIND FLOW

Just as the atmosphere tends to equalize heat distribution, it tends to maintain equal pressure over the earth. Whenever the equilibrium, or balance, is disturbed, air begins to flow from areas of high pressure to areas of lower pressure. As previously stated, highs and lows are produced by unequal heating of the earth's surface. Just as water flows downhill, air flows from high to low pressure areas. In the northern hemisphere, if a storm is near and you turn your back to the wind, the storm center will be to your left and slightly forward.

CLOUDS

A cloud will form whenever moist air is cooled to its dew point, that is, where condensation takes place. When this occurs at the surface of the earth, fog will form. Very high clouds are composed of ice crystals. Clouds that are broken into fragments have the prefix "facto" added to their names. Clouds, in a way, are like signs announcing the coming of specific weather. Typical "bad weather" clouds are fractostratus, fractocumulus, nimbostratus and cumulonimbus.

AIR MASSES

When a large body of air comes to rest over a fairly uniform surface, it picks up the temperature and moisture characteristics of that area—the coldness of the polar regions, the dryness of continents, the heat of the tropics, the moisture of the oceans. It retains these original characteristics for a considerable period of time after leaving its source region. As the air mass passes over other areas, it brings with it a noticeable change in the weather. Cold (sometimes *frigid*) and drier air accompanies a cold air mass. Hot and muggy air accompanies a warm air mass. Cold air masses usually move more rapidly than warm air masses.

COLD FRONT

When a cold air mass from the polar regions moves southward, sooner or later it meets a warm air mass moving up from the tropics. Between the two air masses is an area where air from both mix. This band of mixed air is called a "front." The leading edge of an advancing cold air mass is called a cold front. When the cold front moves forward, it acts like a snow plow, sliding under the warmer air and tossing it aloft. The most marked weather changes take place along cold fronts. They usually lie in a northeast-southwest direction and move east or southeast. They are followed by cooler and drier weather, often preceding severe cold spells.

CROSS SECTION OF CLOUDS ON A COLD FRONT

As the cold air forces the warm air to rise, the warm air cools and cumulonimbus clouds are formed. Heavy precipitation and gusty winds result. The slope of the cold front is much steeper than that of a warm front. Friction tends to hold back the front slightly at the surface. The belt of stormy weather is ordinarily quite narrow, 10 to 50 miles in width. Cold fronts move from 20 to 35 miles per hour. A complete change in weather occurs within a few hours. A wind shift from a southerly to a northerly direction and a rapid rise in pressure occur as the front passes. Since the cold front bends backward there is little advance warning of its arrival from preceding cloudiness.

WARM FRONT

When winds in a warm air mass blow strongly against a colder air mass, the colder air mass retreats. A front along which warmer air is replacing colder air is called a warm front. The warm air gradually slides up over the wedge of colder air lying ahead of it, forming an extensive prefrontal cloud system. In contrast to the bending back of a cold front, the warm front extends forward and all the weather occurs ahead of the front. Advance warning from cloud formations may precede the arrival of the front itself by several days. As the front passes, the temperature rises rapidly, winds shift slightly and fair weather prevails.

CROSS SECTION OF CLOUDS ON A WARM FRONT

Warm frontal clouds may appear 500-600 miles in advance of the point on the ground which marks the position of the front. The first signs are thin wisps of cirrus clouds which have the appearance of "mare's tails." Cirrostratus and altostratus then appear, in that order. The altostratus gradually develop into nimbostratus and precipitation falls. Low stratus clouds, fog and drizzle frequently accompany a warm front. If the cold air has below freezing temperatures, the precipitation may take the form of freezing rain. Thunderstorms (cumulonimbus clouds) may sometimes be found ahead of a warm front.

OCCLUDED FRONT

When a cold and warm front merge into one front, it is known as an occluded front, or occlusion. The warm air mass becomes strapped between two colder air masses, one from the west and one from the east, and is forced aloft. Occluded means "closed in." A broad belt of bad weather accompanies the occluded front. Warm front weather will be followed by cold-front weather in all occlusions.

THUNDERSTORM

Thunderstorms occur with cumulonimbus clouds, commonly called "thunderheads." These clouds grow from cumulus clouds into mountainous forms with great vertical development. The top of the cloud flattens into an anvil shape which points in the direction the storm is moving. The familiar "roll cloud," which precedes the storm, is a horizontally-turning vortex with violent winds. When raindrops split up, static electricity is produced. Lightning is the discharge of this electricity. Thunder is heard because of the sudden expansion of the air caused by the tremendous heat of the lightning. Hail frequently occurs. Thunderstorms develop within an air mass or along fronts. They usually move with the prevailing wind.

TORNADO

A tornado or twister is a very destructive, whirling storm of small diameter with rapidly rising winds at the center. Tornadoes have been reported from every state in the Union, but occur most frequently in the central portion of the U.S. in spring and early summer. They are associated with thunderstorms accompanied by heavy rain and often hail, occurring along, or a short distance in advance of a cold front. The "funnel" cloud builds down from above and its path on the ground is usually less than 25 miles in length, attended by a deafening roar and semidarkness. The updrafts in the center, often exceeding 300 miles per hour, have tremendous lifting effects. Houses in the path of a tornado seem to explode because of the great reduction of pressure on the outside. The walls fall outward in all directions. When tornadoes occur at sea, they are known as waterspouts.

HURRICANE OR TYPHOON

Hurricanes are great whirling storms accompanied by violent destructive winds, torrential rains and high waves and tides. They originate over the oceans in the doldrums and usually move from low to higher latitudes with increasing speed, size and intensity. Movement over land quickly reduces its force. Winds of a hurricane have been known to blow trains off their tracks. However, the greatest loss of life is caused by drowning. The ocean level may rise six feet or more in less than 30 minutes. Torrential rains may cause additional damage by flooding. The rapid and widespread broadcast of warnings by the U.S. Weather Bureau, and evacuations by welfare and military organizations have reduced loss of life greatly.

STATION MODEL

In order to follow the various types of weather which move over the earth, it is necessary to collect weather reports from a great number of stations and to plot this information on maps. In order to plot all weather information in an exact manner it is necessary to use figures and symbols to conserve space. The symbols and the arrangement of this data around a station circle have been adopted internationally. The small circle locates the position of the land station. Each figure and symbol placed in a definite location has a specific meaning.

WEATHER MAP

After all the weather data is plotted around the station circles, the meteorologist draws the weather map. As a geographer draws lines connecting points of equal elevation to show relief, the meteorologist draws lines (isobars) connecting points of equal pressure. This gives a visual picture of the highs and lows. A difference in temperature, wind direction and cloud coverage and formation indicate the location of fronts. From the overall picture the weather map gives, air and frontal movement can be forecast. The symbols used on newspaper weather maps may differ slightly from those used by Weather Bureau stations.

DIRECTIONS FOR USING THE WEATHER WHEEL

1. Observe the direction from which the wind is now coming by watching the movements of clouds, smoke, weather vane, etc.

2. Rotate the disc until that wind direction appears in either hole marked A or B at the top of the instrument. NOTE: The forecast, which now appears in the window at the top, should, for the present, be disregarded.

3. Do not change this setting of the instrument until a shift in the wind direction occurs, probably several hours, perhaps a day later.

4. If the newly observed wind direction appears in one of the holes on the blue side of the instrument, the disc should be rotated until this new wind direction shows in the hole marked A; if on the yellow side, the disc should be rotated to show the new wind direction in the hole marked B. The weather forecast now appears in the window at the top. Do not change this setting of the instrument, because this is the starting point for the next forecast.

5. When the next shift in wind direction is noted, a new forecast can be made by repeating step 4. If an interval of time has elapsed and you have failed to observe the next change of the wind, start with Step 1.

EXAMPLE: Suppose the wind is now from the North; rotate the disc to show N in either hole marked A or B at the top of the instrument. Later, the wind direction shifts to West. Leaving the setting of the instrument unchanged, W is found on the blue side. Therefore, rotate the disc to show W in the hole labeled A. Read the weather forecast and leave the setting unchanged. Later, the wind shifts to Northeast. NE appears on the yellow side of the instrument, therefore rotate the disc to show NE in the hole labeled B. Read weather forecast and leave setting unchanged until next shift in wind, when the operation is again repeated.

GENERAL OBSERVATIONS ON THE USE OF THE WEATHER WHEEL

Because this instrument is designed to forecast weather conditions during all seasons of the year in North America it should be understood that the temperature predictions are relative. A prediction of "rain" should be regarded as precipitation that might be in the form of either rain, snow or sleet, depending on the geographical location of the observer and the season of the year. Observers west of the Continental Divide will omit that portion of the forecast in parentheses when the temperature is falling. The Weather Wheel is not, of course, to be regarded as a substitute for high-grade instruments in forecasting weather; but you will find that its predictions average high in accuracy. The wheel does not give a direct forecast when the wind makes a 180° shift, (as from N to S or NW to SE). For your information, such an about-facing of the wind usually means that you are in the middle of a low pressure storm area, with prospects of ugly weather ahead.

Slightly rising temperature, rain

SE

Moderate temperature, rain

Rising temperature and unsettled weather

S

Moderate temperature, continued unsettled

Moderate temperature, clearing; possible thunderstorms in summer

SW

Rising temperature, gradually unsettled; possible thunderstorms in summer

Lower temperature, clearing, increasing winds

W

Slight temperature change, settled weather

NW

Low[illegible] temper[illegible] continued fa[illegible]

Lower temperature, cloudy, followed by clearing

N

Cool or cold (weather becoming unsettled)

Cool or cold (rain)

Cool or cold (stormy weather)

NE

Lower temperature (continued rain)

Slight temperature change (continued rain)

E

No decided temperature change, cloudy (rain)